IDENTIFICATION OF HAZARDOUS WASTES IN HOSPITALS-PART I

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Hazardous Waste

- Congress enacted Resource Conservation and Recovery Act (RCRA) in 1976
- EPA gave Colorado authority to implement the Colorado Hazardous Regulations in 1984

Hazardous Waste Regulations

- Around for a long time
- Colorado has regulated all industry that generates hazardous waste since 1984
- Manufacturing, painting, labs, healthcare, and pharmaceutical waste

Definition of a Hazardous Waste 6 CCR 1007-3, Section 261.3

A hazardous waste is a solid, a liquid or a contained gaseous material that is no longer used and that no longer serves the purpose for which it was produced, and could pose dangers to human health and the environment after it is discarded.

Hazardous Waste Generators

- Must ensure that the hazardous waste is disposed of at a permitted hazardous waste disposal facility
- Other regulations apply depending on your generator category

Hazardous Waste Generator Categories

- Conditionally Exempt Small Quantity Generators (CESQG)
- Small Quantity Generators (SQG)
- Large Quantity Generators (LQG)

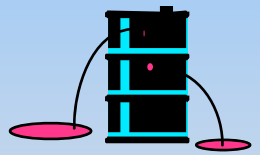
Waste Medications can be Characteristic and/or Listed Hazardous Wastes

CHARACTERISTIC WASTE CODES APPLICABLE 6 CCR 1007-3 Subpart C

Display one or more of the four generic hazardous properties

- Ignitable, D001

- Corrosive, D002



- Reactive, D003

- Toxic, D004➔D043

Ignitable-D001 Characteristic Haz Wastes

- Aqueous drug formulation containing 24% or more alcohol by volume
- Liquid with flashpoint <140 F.
- Flammable aerosol propellants meeting the DOT definition of compressed gas
- Example: HurriCaine Spray;

6 CCR 1007.3 Section 261.24
Table 1. – Maximum Concentration of Contaminants for the Toxicity Characteristic

Waste Code	Contaminant	Maximum Concentration
• D004	Arsenic	5 mg/L
• D005	Barium	100 mg/L
• D007	Chromium	5 mg/L
• D013	Lindane	0.4 mg/L
• D009	Mercury	0.2 mg/L
• D010	Selenium	1 mg/L
• D011	Silver	5 mg/L

Examples of Toxic D004-D043 Characteristic Haz Wastes

- D009-Mercury (0.2 mg/L)
  - Any drug w/thimerosal or phenylmercuric acetate (eye drops, nasal spray, some multi dose vaccines, etc.)
    - Also may be P-listed

- D024-M-cresol (200 mg/L)
  - Insulin w/cresol
    - Also may be U-listed

Listed Hazardous Waste

- Chemicals that present a threat to human health or the environment when disposed
  - U-listed
    - medications
  - P-listed
    - medications
  - F-listed
    - solvents

U Wastes – Toxic Wastes
6 CCR 1007-3 261.33

Hazardous Waste No	Chemical Abstract No	Substance	Common Name
U015	115-02-6	L-Serine, diazoacetate (ester)	Azarserine
See F027	93-72-1	Silvex (2,4,5-TP)	Same
U206	18883-66-4	Streptozotocin	Same
U103	77-78-1	Sulfuric acid, dimethyl ester	Dimethyl sulfate
U189	1314-80-3	Sulfur phosphide (R)	Phosphorus pentasulfide

The MSDS

- MSDS are required by OSHA, and must list the hazardous chemicals that are found in a product in quantities of 1% or greater, or 0.1% or greater if the chemical is a carcinogen
- 1% = 10,000 Parts per million (ppm)
- For example
  - A waste which leaches lead @ 5 ppm meets the definition of a hazardous waste

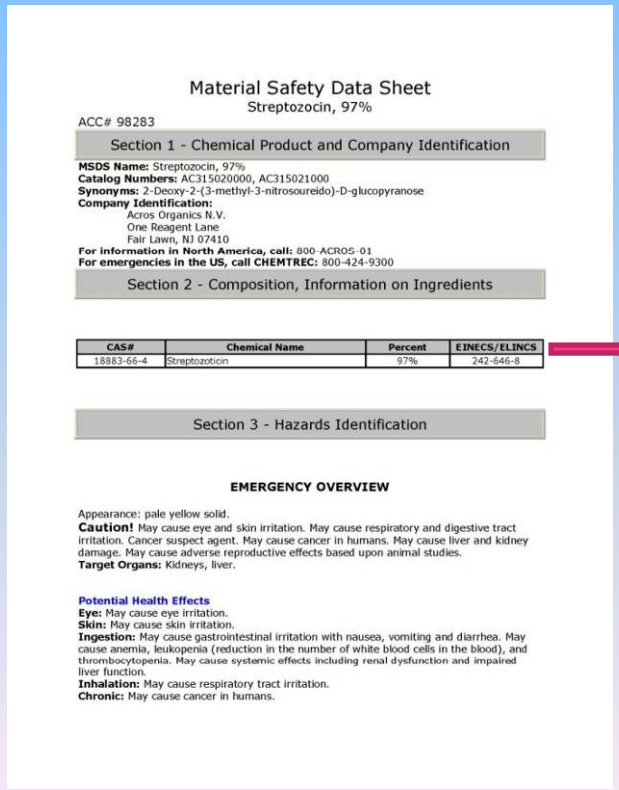
Moving From % To ppm to mg/l

- PPM = mg/l
- 100% = 1,000,000 parts per million (ppm)
- 10 %= 100,000 parts per million (ppm)
- 1% = 10,000 parts per million (ppm)
- 0.1%=1,000 parts per million (ppm
- 0.3 % m cresol = ? ppm

Using the MSDS to assist in the Characterization of Waste

Example of a toxic hazardous waste (U206)

Streptozocin



Material Safety Data Sheet
Streptozocin, 97%

ACC# 98283

Section 1 - Chemical Product and Company Identification

MSDS Name: Streptozocin, 97%
Catalog Numbers: AC315020000, AC315021000
Synonyms: 2-Deoxy-2-(3-methyl-3-nitrosoureido)-D-glucopyranose
Company Identification:
Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410
For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
18883-66-4	Streptozoticin	97%	242-646-8

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: pale yellow solid.
Caution! May cause eye and skin irritation. May cause respiratory and digestive tract irritation. Cancer suspect agent. May cause cancer in humans. May cause liver and kidney damage. May cause adverse reproductive effects based upon animal studies.
Target Organs: Kidneys, liver.

Potential Health Effects
Eye: May cause eye irritation.
Skin: May cause skin irritation.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause anemia, leukopenia (reduction in the number of white blood cells in the blood), and thrombocytopenia. May cause systemic effects including renal dysfunction and impaired liver function.
Inhalation: May cause respiratory tract irritation.
Chronic: May cause cancer in humans.

CAS#	Chemical Name	Percent	EINECS/ELINCS
18883-66-4	Streptozoticin	97%	242-646-8

CAS Number vs. NDC

- The P and U listings are based on the active ingredient associated with the Chemical Abstract Number (CAS)
- If you use the National Drug Code (NDC) instead of the Chemical Abstract Number, make sure to cross reference the NDC with the CAS Number

Examples of U Codes

- U010
  - Mitomycin C, Mitomycin; Mutamycin
- U035
  - Chlorambucil,Leukeran
- U058
  - Cyclophosphamide, CTX; Lycophilized/VHA Plus; Neosar; Procytox

P Listed Hazardous Wastes

- 2.2 lbs or more of acute (P listed) hazardous waste=LQG
- Empty containers that held “P” listed drugs are hazardous wastes
- If you triple-rinse the containers, the rinsate must be managed as a hazardous waste

P Wastes – Acute Hazardous Wastes 6 CCR 1007-3 261.33

Hazardous Waste No	Chemical Abstract No	Substance	Common Name
P127	1563-66-2	7-Benzofuranol, 2,3-dihydro-2,2-dimethyl-,methylcarbamate	Carbofuran
P188	57-64-7	Benzoic acid, 2-hydroxy-, compd. with (3aS-cis)-1,2,3,3a,8,8a-hexahydro-1,3a,8-trimethylpyrrolo[2,3-b]indol-5-yl methylcarbamate ester (1:1)	Physostigmine, salicylate
P001	81-81-2	2H-1-Benzopyran-2-one, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-, & salts, when present at concentrations greater than 0.3%	Warfarin salts, when present at concentrations of greater than 0.3%

Material Safety Data Sheet (MSDS)

Safety data for warfarin

Glossary of terms on this data sheet

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: 4-hydroxy-3-(3-oxo-1-phenylbutyl)coumarin, 4-hydroxy-3-(3-oxo-1-phenylbutyl)-2H-1-benzopyran-2-one, Tox-Hid, Warf, Warfarat, co-r-tox, co-rax, d-con, dethmor, mar-fin, rattunal, rax, rodex, rosex, solfarin, coumafene, 3-(a-acetonylbenzyl)-4-hydroxy-Coumarin, Warfarin-alcohol, (RS)-Warfarin, 1-(4'-Hydroxy-3'-coumarinyl)-1-phenyl-3-butanone, 3-(a-Acetonylbenzyl)-4-hydroxycoumarin, 3-(a-Phenyl-b-acetylethyl)-4-hydroxycoumarin, 3-(1'-Phenyl-2'-acetylethyl)-4-hydroxycoumarin, 4-Hydroxy-3-(3-oxo-1-phenylbutyl)-2H-chromen-2-one, Athrombine-K, Brumolin, coumadin, Coumafen, Coumaphen, Coumefene, DL-3-(a-Acetonylbenzyl)-4-hydroxycoumarin, dethmor, dethnel, fasco fascrat powder, Kumader, Kumadu, Kumatox, rac-Warfarin, maveran, ratox, rat-mix, rat-o-cide, Ratron, Ratron G, Rodafarin, Rodafarin C, Temus W, Vampirinip II, Vampirinip III, W.A.R.F. 42, WARF compound 42, Warfarin, Zoocoumarin, numerous further names
Use: anticoagulant, rodenticide
Molecular formula: $C_{19}H_{16}O_4$
CAS No: 81-81-2 (old CAS numbers 56573-89-8, 5543-56-6)
EINECS No:

Physical data

Appearance: solid
Melting point: 161 - 162 C
Boiling point: decomposes
Vapour density:
Vapour pressure:
Density (g cm^{-3}):
Flash point:
Explosion limits:

Autoignition temperature:
Water solubility: 1.7 mg/100 ml at 20 C

Stability

Stable. Incompatible with strong oxidizing agents.

Toxicology

Very toxic if swallowed or inhaled. Causes internal hemorrhage. Toxic if absorbed through the skin. May act as a teratogen.

Toxicity data
(The meaning of any toxicological abbreviations which appear in this section is given here.)
ORL-RAT LD50 3 mg kg^{-1} to 186 mg kg^{-1}
SKN-RAT LD50 1400 mg kg^{-1}
ORL-MUS LD50 60 mg kg^{-1}
ORL-HMN LDLO 7 mg kg^{-1}
ORL-MUS LD50 374 mg kg^{-1}

Risk phrases
(The meaning of any risk phrases which appear in this section is given here.)
R24 R26 R28 R48 R61.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)

Personal protection

Safety glasses, gloves. Take care to avoid breathing dust.

Safety phrases
(The meaning of any safety phrases which appear in this section is given here.)
S24 S25 S45 S53.

[Return to Physical & Theoretical Chemistry Lab. Safety home page]

MSDS-Characterization of Waste

Example of an acute hazardous waste (P001)

Warfarin

Safety data for warfarin

TOXIC

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Density (g cm^{-3}):
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Explosion limits:

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Example RCRA P-Listed Waste Codes

- P001
  - Warfarin & salts (concentration > 0.3%); Coumadin, Warfarin
- P012
  - Arsenic trioxide; Trisenox
- P075
  - Nicotine & salts; Nicotine patches, Habitrol, Nicoderm, Nicorette, Nicotrol, Tetrahydronicotyrine

Some Pharma FAQs

- Epinephrine salts are not P042 hazardous waste in Colorado
- Medicinal nitroglycerin is generally not reactive (i.e., not P081 hazardous waste) but 5mg/ml concentration may be ignitable (D001)
- For controlled substances that are also hazardous wastes, follow DEA guidelines for disposal
- Sharps are not considered hazardous waste